

REMARKS

Initially, Applicants would like to thank Examiner Nguyen for granting an interview and for his time spent in the interview. Applicants would also like to thank Primary Examiner Jackson for attending the interview and for his time spent in the interview.

Claims 1, 2, 4-6, 9-11, 14, 15 and 17 are pending in the application.

Claims 1, 4 and 5 are rejected as anticipated by TOMIYAMA et al. 6,053,953. This rejection is respectfully traversed.

Claim 1 provides that an averaged diameter of activated carbon powder is in the range of 5 micrometers to 13 micrometers and the particle size distribution thereof is in the range of 2 micrometers to 20 micrometers.

As set forth at the interview, claim 1 includes two criteria: 1) average particle diameter and 2) particle size distribution. A definition of these two different criteria as set forth by Lifescience and as used in HPLC is submitted herewith for explanatory purposes only in an attempt to clarify a distinction between the two criteria.

As disclosed on page 15, lines 5-10 of the present application, the examples disclosed on pages 10-12 show that a double layer capacitor as recited in the claims has an increased capacity and a reduced equivalent series resistance. The

increased capacity is obtained by having a particle size distribution of the activated carbon powders in a narrow range of 2 micrometers to 20 micrometers to obtain a large density.

The position set forth in the Official Action is that TOMIYAMA et al. at column 8, lines 48-50 teach a particle size distribution of 0.1 to 50 micrometers. However, as pointed out at the interview, it does not appear that TOMIYAMA teaches that for which it is offered. The range noted on column 8, lines 48-50 of TOMIYAMA is an average particle size of the positive active material. This positive active material does not appear to include the recited activated carbon powder. Rather, the positive active material of TOMIYAMA includes transition metal oxides and transition metal chalcogenides. Specific examples of the positive active material of TOMIYAMA are taught on column 7, line 56 through column 8, line 32 and do not include activated carbon material.

Moreover, as pointed out at the interview, the range of TOMIYAMA is with respect to an average particle size, not a particle size distribution. In addition, such range includes values below the recited range and values above the recited range. Using activated carbon powders in the particle size range disclosed by TOMIYAMA et al. would result in a capacitor having a different density and thus a different capacity.

As pointed out at the interview, the recited range is a narrow range that precludes values above and below this range.

Since TOMIYAMA et al. includes values above and below the recited range, TOMIYAMA et al. does not anticipate claim 1.

As to the range of 0.1  $\mu\text{m}$  to 20  $\mu\text{m}$  noted on column 6, lines 24-37 of TOMIYAMA, as set forth at the interview, this range is an average particle size for the carbon black of the negative electrode. However, TOMIYAMA et al. do not disclose or suggest a particle size distribution of activated carbon powder, and in any event, the ranges noted in the Official Action include values that are precluded by the recited range.

Accordingly, TOMIYAMA et al. does not disclose that which is recited and thus does not anticipate claim 1. Claims 4 and 5 depend from claim 1 and further define the invention and are also believed patentable over TOMIYAMA et al.

Claims 6, 9-11, 14, 15 and 17 are rejected as unpatentable over TOMIYAMA et al. in view of FONG et al. 5,069,683 and ANDELMAN 6,127,474. This rejection is respectfully traversed.

Independent claim 6 provides that an averaged diameter of activated carbon powder is in a range of 5 micrometers to 13 micrometers and the particle size distribution thereof is in the range of 2 micrometers to 20 micrometers. The analysis above regarding claim 1 is equally applicable to claim 6 with respect to TOMIYAMA et al.

FONG et al. is only cited for the teaching of an electrode having a density in the range of 0.2  $\text{g}/\text{cm}^3$  to 2.0

g/cm<sup>3</sup>. FONG et al. do not teach or suggest that an average diameter of activated carbon powder is in the range of 5 micrometers to 13 micrometers and the particle size distribution thereof is in a range of 2 micrometers to 20 micrometers as recited in claim 6.

ANDELMAN is only cited for the teaching of a specific resistance within 2-7 ohm centimeters. ANDELMAN does not teach or suggest an average diameter of an activated carbon powder in the range of 5 micrometers to 13 micrometers and the particle size distribution thereof is in the range of 2 micrometers to 20 micrometers.

The above-noted feature is missing from each of the references, is absent from the combination and thus is not obvious to one having ordinary skill in the art.

Claim 9 depends from claim 6 and further defines the invention and is also believed patentable over the cited prior art. Claim 17 depends from claim 1. As set forth above, claim 1 includes the same limitation as claim 6. Therefore, the proposed combination of references would not render obvious claim 17.

Claim 11 also provides that an average diameter of the activated carbon powder is in the range of 5 micrometers to 13 micrometers and the particle size distribution thereof is in the range of 2 micrometers to 20 micrometers. The analysis above regarding claim 6 is equally applicable to claim 11. Claims 14

and 15 depend from claim 11 and further define the invention and are also believed patentable over the cited prior art.

Claim 2 is rejected as unpatentable over TOMIYAMA et al. in view of ANDELMAN. This rejection is respectfully traversed.

As set forth above, ANDELMAN is only cited for the teaching of a specific resistance of 2 to 7 ohm centimeters. ANDELMAN does not teach or suggest an average diameter of activated carbon powders in the range of 5 micrometer to 13 micrometer and the particle size distribution thereof is in the range of 2 micrometer to 20 micrometer as recited in claim 1. As noted above, TOMIYAMA et al. do not teach or suggest what is recited in claim 1. Since claim 2 depends from claim 1 and further defines the invention, the proposed combination of references would not render obvious claim 2.

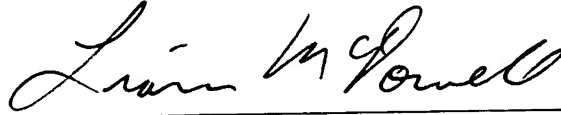
In view of the foregoing Remarks and as set forth at the interview, it is believed that the present application is in condition for allowance. Reconsideration and allowance are respectfully requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any

overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. \$1.16 or under 37 C.F.R.\$1.17.

Respectfully submitted,

YOUNG & THOMPSON

A handwritten signature in cursive script, reading "Liam McDowell". The signature is written in dark ink and is positioned above a horizontal line.

---

Liam McDowell, Reg. No. 44,231  
745 South 23<sup>rd</sup> Street  
Arlington, VA 22202  
Telephone (703) 521-2297  
Telefax (703) 685-0573  
(703) 979-4709

LM/fb

APPENDIX

- copy of lifescience definition
- copy of HPLC definition

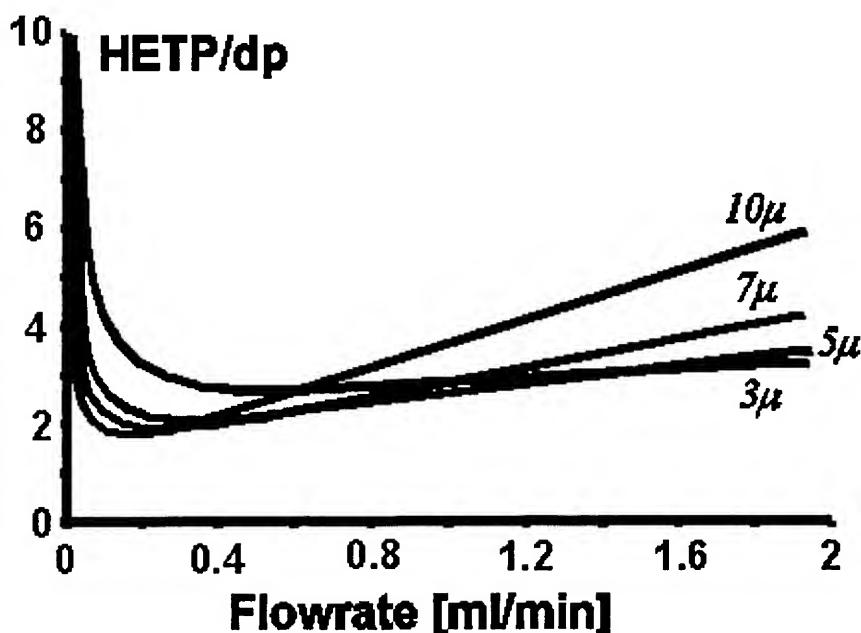
## Particle size and distribution

Particle size is a dimension which is determined by its geometry. For spherical particles, it is their diameter. For irregularly shaped particle it is the diameter of the equivalent sphere which has the same volume as a particle.

Silica particles are always obtained with a particle size distribution. Particle diameter for any HPLC packing is a mean value of all particle diameters. Most LC packing materials have a Gaussian type of particle size distribution, so the position of the maximum is the mean particle diameter, and the standard deviation represent the distribution width.

In HPLC practice, the less the particle size distribution the more uniform packing in the chromatographic column can be achieved, and the more efficient the column will be. The presence of the larger sized particles only effect the column efficiency, but the presence of the very small particles (fine), less than 1  $\mu\text{m}$ , may lead to the column frit clogging and rising of the column backpressure.

The effect of the particle size on the column efficiency and Van Deemter curve profile are shown in the figure below.



*Van Deemter curves for the columns packed with particles of different size.*

**BEST AVAILABLE COPY**



## GLOSSARY (continued)

**Particle Size Distribution.** A measure of the distribution of the particles used to manufacture a column. In HPLC a narrow particle size distribution is desirable. For a 10 $\mu$ m size particle, a particle size distribution of  $dp \pm 10\%$  means that 90% of the particles have a 9-11 $\mu$ m size.

**Particle Size (dp).** This term refers to the average particle size of the material packed into a column.

**Peak Broadening.** The tendency of a chromatographic peak to broaden as it passes through the column. It is also known as peak spreading or peak dispersion. The peak width or the number of theoretical plates in the column (N) is a measure of peak broadening.

**Polarity.** A measure of the separation of charges within a molecule. Polar molecules interact more strongly with and are best separated on polar stationary phases.

**Polymeric Packing.** Packings based on polymeric materials, usually in the form of spherical beads. Common polymers include polystyrene-divinylbenzene, polymethacrylate and polyvinylalcohol.

**Polymeric Phase.** A bonded phase in which typically a di- or trichlorosilane is reacted with more than one reactive silanol group on the surface of silica.

**Pore Size (Mean Pore Diameter).** The average pore diameter of the pore in a porous packing. The pore diameter is important in that it must allow free diffusion of solute molecules into and out of the pore so that the solute can interact with the stationary phase. In SEC, the packings have different pore diameters, and therefore molecules of different sizes can be separated. For a typical adsorbent such as silica gel, 60Å and 100Å pore diameters are most popular. For packings used for the separation of biomolecules, pore diameters >300Å are used.

**Pore Volume.** The total volume of the pores in a porous packing, usually expressed in ml/g. It is measured by the BET method of nitrogen adsorption or by mercury intrusion, in which mercury is pumped into the pores under high pressure.

**Precolumn.** A column packed with silica placed between the pump and the injector. It presaturates the eluent with stationary phase minimizing loss of the latter from the main column. It will also remove particulate material.

**Pressure Drop.** The difference in pressure between the inlet and outlet of a column during flow caused by the hydrodynamic resistance of the packed bed.

**Residual Silanols.** These are the silanol (-SiOH) groups that remain on the surface of a silica after a bulky phase is chemically bonded to its surface. Their numbers can be reduced by further reacting (endcapping) the silica surface with a small organosilane.

**Resolution.** A measure of the separation of two adjacent peaks. The higher the resolution value the greater the separation (see p.229).

**Retention Time.** The elapsed time between sample injection and the appearance of the chromatographic peak apex.

**Sample Capacity.** The term refers to the amount of sample that can be injected onto a column without overloading it. In preparative applications it is typically expressed as grams of solute per gram of stationary phase.

**Selectivity ( $\alpha$ ).** The ratio of capacity factors of adjacent peaks (see p.229). Also referred to as **separation factor** or **relative retention ratio**.

**Siloxane Bond.** The main -Si-O-Si- bond found in silica.

**Size Exclusion Chromatography (SEC).** A mode of HPLC used mainly to separate high molecular weight samples and to determine their molecular weight distribution by virtue of their size in solution. Also known as gel permeation, gel filtration or steric exclusion chromatography.

**Surface Area.** The total area of the phase's solid surface. For silica it is typically 100-600 m<sup>2</sup>/g.

**Tailing.** The phenomenon in which a peak has an asymmetry factor >1. The downside of the peak will be skew.

**Theoretical Plate.** Measure of column efficiency. Length of column relating to this concept is called height equivalent to a theoretical plate (HETP).

**Void.** The formation of a space, usually at the head of the column, caused by a settling or dissolution of the packing. A void in the column leads to decreased efficiency and loss of resolution.

**Void Volume ( $V_0$ ).** The total volume of eluent in the column, the remainder being taken up by packing material. Can be determined by injecting an unretained substance.

**Zero Dead Volume (ZDV).** It refers to a fitting which adds no extra volume to the system. In practice ZDV fittings have a finite but insignificant volume.

**Zwitterions.** Compounds that carry both positive and negative charges in solution.

<http://www.lifescience.ca/catalogue/>

/s\_ pages 180-184.pdf